AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

22. (*previously presented*) Apparatus for determining a desired biologic constituent concentration of the blood of a patient when the blood is flowing in a pulsatile fashion in a body part of the patient so as to be subjectable to transcutaneous examination in the body part, the body part defining a blood conduit, the comprising:

(a) a blood conduit receiver for receiving the blood conduit with the blood flowing therein;

(b) radiation-directing means for directing radiation into the flowing blood within the blood conduit, the radiation-directing means being situated within the blood conduit receiver, the radiation defining a directed radiation comprising a first quantity of radiation at a chosen radiation wavelength that, when directed into the flowing blood within the blood conduit, has:

(A) a first attenuation value that varies with the desired biologic constituent concentration in the flowing blood and

(B) a second attenuation value that varies with the concentration of components other than the desired biologic constituent in the flowing blood, which second attenuation value is at least ten times smaller than the first attenuation value, and

(c) radiation-detecting means for detecting the portion of the directed radiation that passes through both the blood conduit and the flowing blood therein, the radiation-detecting means being situated within the blood conduit receiver, the detected portion of the directed radiation comprising a second quantity of radiation at the chosen radiation wavelength;

(d) energy-detecting means for detecting energy from the flowing blood within the blood conduit and for measuring the time rate of change of blood volume, the energy-detecting means being situated within the blood conduit receiver, the energy defining a transduced energy comprising a quantity of energy which when detected from the flowing blood within the blood conduit, has a value that varies with the normalized change of the pulsatile blood; and

(e) operating means for operating exclusively on the second quantity of the radiation and the transduced energy to determine the desired biologic constituent concentration.

23. (*previously presented*) The apparatus as defined in claim 22, wherein the energy-detecting means includes:

(a) means for determining the intensity of the radiation wavelength; and

(b) means for determining a radiation wavelength pulsatile value representing the intensities of a pulsatile component of the radiation wavelength at discreet time intervals during the pulse.

24. (*previously presented*) The apparatus as defined in claim 22, wherein the energy-detecting means includes:

(a) means for determining the electronic signal generated from the transduced energy; and

(b) means for determining a transduced energy pulsatile value representing the intensities of a pulsatile component of the transduced energy at discreet time intervals during the pulse.

25. (*previously presented*) The apparatus as defined in claim 22, wherein the operating means includes:

(a) means for mathematically operating on the second quantity of the radiation such that the time derivative of the pulsatile intensities is normalized by the average intensity over the pulse interval followed by a distance derivative of that quantity to produce a value proportional to $\partial\alpha / \partial t$; and

(b) means for mathematically operating on the second quantity of the radiation such that the logarithm of the intensity is distance differentiated to produce the value α.

26. (*previously presented*) The apparatus as defined in claim 22, wherein the operating means includes means for performing the time derivative of the normalized pulsatile transduced energy to obtain the value $\partial X_b / \partial_t$, where X_b is the fractional volume of blood per total tissue volume and t is time.

27. (*previously presented*) The apparatus as defined in claim 22, wherein the operating means includes means for mathematically solving the relationship $K_b = B \cdot (\alpha \cdot \partial\alpha / \partial t) / (\partial X_b / \partial t)$ with a polynomial function or empirically determined value, where K_b is the macroscopic absorption coefficient for whole blood, α is the bulk attenuation coefficient of the tissue sample, t is time, and X_b is the fractional volume of blood per total tissue volume.

28. (*previously presented*) The apparatus as defined in claim 22, wherein the desired biologic constituent comprises hematocrit or hemoglobin.

29. (*previously presented*) The apparatus as defined in claim 22, wherein the first attenuation value of the directed radiation from the radiation-directing means is substantially the same amount for oxyhemoglobin and for reduced hemoglobin in the flowing blood and the second attenuation value of the directed radiation from the radiation-directing means is at least ten items smaller than the first attenuation value for any competing constituent in the flowing blood.

30. (*previously presented*) The apparatus as defined in claim 22, wherein the radiation wavelength of the directed radiation from the radiation-directing means is in the range from about 790 nanometers to 850 nanometers.

31. (*previously presented*) The apparatus as defined in claim 22, wherein the radiation wavelength of the directed radiation from the radiation-directing means is in the range from about 550 nanometers to 600 nanometers.

32. (*previously presented*) The apparatus as defined in claim 22, wherein the energy-detecting means is selected from the group consisting of a pressure transducer element, a strain gage element, a piezo-electric film element, and a Doppler detection element.

33. (*previously presented*) Apparatus for determining a desired biologic constituent concentration of the blood of a patient when the blood flowing in a pulsatile fashion in a body part of the patient so as to be subjectable to transcutaneous examination in the body part, the body part defining a blood conduit, the apparatus comprising;

(a) a blood conduit receiver for receiving the blood conduit with the blood flowing therein;

(b) radiation-directing means for directing radiation into the flowing blood within the blood conduit, the radiation-directing means being situated within the blood conduit receiver, the radiation defining a directed radiation comprising:

(i) a first quantity of radiation at a first radiation wavelength that, when directed into the flowing blood within the blood conduit, has:

(A) a first attenuation value that varies with the desired biologic constituent concentration in the flowing blood and

(B) a second attenuation value that varies with the concentration of components other than the desired biologic constituent in the flowing blood, which second attenuation value is at least ten times smaller than the first attenuation value, and

(ii) a first quantity of radiation at a second radiation wavelength, distinct from the first wavelength, that, when directed into the flowing blood within the blood conduit, has:

(A) a third attenuation value which for varying concentrations in the flowing blood of the desired blood constituent is a non-fixed multiple of the first attenuation value; and

(B) a fourth attenuation value that varies with the concentration of components other than the desired biologic constituent in the flowing blood, which fourth attenuation value is at least ten times greater than the second attenuation value;

(c) radiation-detecting means for detecting the portion of the directed radiation that passes through both the blood conduit and the flowing blood therein, the radiation-detecting means being situated within the blood conduit receiver, the detected portion of the directed radiation comprising:

(i) a second quantity of radiation at the first radiation wavelength; and,

(ii) a second quantity of radiation at the second radiation wavelength;

(d) energy-detecting means for detecting energy from the flowing blood within the blood conduit and for measuring the time rate of change of blood volume, the energy-detecting means being situated within the blood conduit receiver, the energy defining a transduced energy comprising a quantity of energy which when detected from the flowing blood within the blood conduit, has a value that varies with the normalized blood change of the pulsatile blood; and

(e) operating means for operating exclusively on the second quantities of the radiations and the transduced energy to determine the desired biologic constituent concentration.

34. (*previously presented*) The apparatus as defined in claim 33, wherein the operating means includes means for performing the time derivative of the normal pulsatile transduced energy of the second radiation wavelength to obtain the value $\partial X_b / \partial t$, which is the time rate of change of blood volume.

35. (*previously presented*) The apparatus as defined in claim 33, wherein the operating means includes means for solving the relationship $f(H) = G \cdot (\alpha \cdot \partial\alpha / \alpha t)$ for the first wavelength divided by $(\alpha \cdot \partial\alpha / \partial t)$ for the second wavelength with a polynomial function or empirically determined value, where H is hematocrit, G is a constant related to bulk tissue absorption and scattering, α is the bulk attenuation coefficient of a tissue sample, and t is time.

36. (*previously presented*) Apparatus for determining a desired biologic constituent concentration of the blood of a patient when the blood is flowing in a pulsatile fashion in a body part of the patient so as to be subjectable to transcutaneous examination in the body part, the body part defining a blood conduit, the apparatus comprising:

(a) a blood conduit receiver for receiving the blood conduit with the blood flowing therein;

(b) radiation-directing means for directing radiation into the flowing blood within the blood conduit, the radiation-directing means being situated within the blood conduit receiver, the radiation defining a directed radiation comprising a first quantity of radiation at a chosen radiation wavelength which, when directed into the flowing blood within the blood conduit, has:

(A) a first attenuation value that varies with the desired biologic constituent concentration in the flowing blood and

(B) a second attenuation value that varies with the concentration of components other than the desired biologic constituent in the flowing blood, which second attenuation value is at least ten times smaller than the first attenuation value;

(c) radiation-detecting means for detecting the portion of the directed radiation that passes through both the blood conduit and the flowing blood therein, the radiation-detecting means being within the blood conduit receiver, the detected portion of the directed radiation comprising a second quantity of radiation at the chosen radiation wavelength; and

(d) energy-detecting means for detecting energy from the flowing blood within the blood conduit and for measuring the time rate of change of blood volume, the energy-detecting means being situated within the blood conduit receiver, the energy defining a transduced energy comprising a quantity of energy which when detected from the flowing blood within the blood conduit, has a value that varies with the normalized blood volume; and

(e) operating means for operating exclusively on the second quantity of the radiation and the transduced energy to determine the desired biologic constituent concentration.

37. (*previously presented*) The apparatus as defined in claim 36, wherein the operating means comprises means for obtaining the value X_b by first measuring the transduced energy when the blood conduit is blood-filled, then later measuring the transduced energy when the blood conduit is made blood-less, where X_b is the volume of blood per total tissue volume.

38. (*previously presented*) The apparatus as defined in claim 37, wherein the means for obtaining X_b comprises means for solving $(V_o / V_f) - 1$, where V_o is the volume of a bloodless finger and V_f is the volume of a blood filled finger.

39. (*previously presented*) The apparatus as defined in claim 37, wherein the means for obtaining X_b comprises means for solving $(V_o / V_f) - 1$ with a polynomial function, where V_o is the volume of a bloodless finger and V_f is the volume of a blood filled finger, and wherein the energy-detecting means comprises a pressure transducer.

40. (*currently amended*) Apparatus for determining a desired biologic constituent concentration of the blood of a patient when the blood is flowing in a pulsatile fashion in a body part of the patient so as to be subjectable to transcutaneous examination in the body part, the body part defining a blood conduit, the apparatus comprising:

(a) a blood conduit receiver for receiving the blood conduit with the blood flowing therein;

(b) radiation-directing means for directing radiation into the flowing blood within the blood conduit, ~~using a radiation generator~~ the radiation-directing means being situated within the blood conduit receiver, the radiation defining a directed radiation comprising a first quantity of a radiation at a chosen radiation wavelength which, when directed into the flowing blood within the blood conduit, has:

(A) a first attenuation value that varies with the desired biologic constituent concentration in the flowing blood and

(B) a second attenuation value that varies with the concentration of components other than the desired biologic constituent in the flowing blood, which second attenuation value is at least ten times smaller than the first attenuation value;

(c) radiation-detecting means for detecting the portion of the directed radiation that passes through both the blood conduit and the flowing blood therein, ~~using a radiation detector~~ the radiation-detecting means being situated within the blood conduit receiver, the detected portion of the directed radiation comprising a second quantity of radiation at the chosen radiation wavelength;

(d) energy-detecting means for detecting energy from the flowing blood within the blood conduit and for measuring the time rate of change of blood volume, the energy-detecting means being situated within the blood conduit receiver, the energy defining a transduced energy comprising a quantity of energy which when detected from the flowing blood within the blood conduit, has a value that varies with the normalized change of the pulsatile blood; and

(e) operating means for operating exclusively on the second quantity of the radiation and the transduced energy to determine the desired biologic constituent concentration by quantifying the tissue's homogeneity from the linearity of the distance differentiation.

41. (*previously presented*) The apparatus as defined in claim 40, wherein the operating means includes:

(a) means for mathematically operating on the second quantity of the radiation wavelength such that the logarithm of the intensity is distance differentiated to produce the value α;

(b) means for mathematically operating on the second quantity of the radiation wavelength such that the time derivative of the pulsatile intensities is normalized by the average intensity over the pulse interval followed by a distance derivative of that quantity to produce a value proportional to $\partial\alpha / \partial t$, where $\partial\alpha / \partial t$ is the change in the bulk attenuation coefficient over time;

(c) means for mathematically determining the linearity and deviation of the logarithm of the intensity and the $(\partial i / \partial t) / i$ values versus distance, where i is light intensity and t is time; and

(d) means for mathematically decoupling, isolating, and determining the individual constituent absorptive and scattering coefficients from the values of α (the bulk attenuation coefficient), $\partial\alpha / \partial t$, and $\partial X_b / \partial t$ (the change in blood volume over time).